



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : A61L 15/58, 25/00	A1	(11) International Publication Number: WO 98/09666 (43) International Publication Date: 12 March 1998 (12.03.98)
(21) International Application Number: PCT/US97/13296 (22) International Filing Date: 31 July 1997 (31.07.97) (30) Priority Data: 08/709,557 5 September 1996 (05.09.96) US (71) Applicant: MINNESOTA MINING AND MANUFACTURING COMPANY [US/US]; 3M Center, P.O. Box 33427, Saint Paul, MN 55133-3427 (US). (72) Inventors: CHEN, Yen-Lane; P.O. Box 33427, Saint Paul, MN 55133-3427 (US). YOUNG, Chung, I.; P.O. Box 33427, Saint Paul, MN 55133-3427 (US). LU, Ying-Yuh; P.O. Box 33427, Saint Paul, MN 55133-3427 (US). DIETZ, Timothy, M.; P.O. Box 33427, Saint Paul, MN 55133-3427 (US). (74) Agents: SPRAGUE, Robert, W. et al.; Minnesota Mining and Manufacturing Company, Office of Intellectual Property Counsel, P.O. Box 33427, Saint Paul, MN 55133-3427 (US).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>
(54) Title: ABSORBENT DRESSING (57) Abstract An absorbent dressing that includes a transparent, elastomeric, body fluid-absorbing composition that is essentially free of hydrocolloidal gel particles. The composition includes the reaction product of: (a) 20 to 80 parts by weight of an acrylic or methacrylic acid ester of a non-tertiary alcohol having between 4 and 14 carbon atoms, inclusive; (b) 30 to 60 parts by weight of a hydrophilic, ethylenically unsaturated monomer; and (c) 5 to 25 parts by weight of a polar, ethylenically unsaturated monomer different from the hydrophilic, ethylenically unsaturated monomer. The composition is capable of absorbing moderate to heavy amounts of body fluids, while retaining its structural integrity and transparency.		

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

ABSORBENT DRESSING

Background of the Invention

This invention relates to absorbing body fluids, e.g., from wounds.

5 Various dressings designed for absorbing moderate to heavy amounts of body fluids have been proposed. Such dressings are useful in applications such as wound care, ostomy care, and prosthesis applications. One type of dressing features swellable, hydrocolloidal, gel particles dispersed in a continuous pressure sensitive adhesive matrix. In such dressings, the gel particles absorb body fluids and
10 swell.

Summary of the Invention

In a first aspect, the invention features an absorbent dressing that includes a transparent, elastomeric, body fluid-absorbing composition that is essentially free of
15 hydrocolloidal gel particles. By "transparent" it is meant that when applied to a patient (e.g., at a wound site), the area underlying the dressing can be visualized sufficiently to permit observation by a health care worker. The composition is capable of absorbing moderate to heavy amounts of body fluids, while retaining its structural integrity (i.e., while remaining sufficiently intact such that it can perform
20 the function of acting as an absorbent dressing) and transparency. The composition includes the reaction product of:

- (a) 20 to 80 parts by weight of an acrylic or methacrylic acid ester of a non-tertiary alcohol having between 4 and 14 carbon atoms, inclusive;
- (b) 10 to 60 parts by weight of a hydrophilic, ethylenically unsaturated
25 monomer; and
- (c) 5 to 25 parts by weight of a polar, ethylenically unsaturated monomer different from the hydrophilic, ethylenically unsaturated monomer. By "hydrophilic" it is meant that the monomer has a substantial affinity for water.

In preferred embodiments, the acrylic or methacrylic acid ester is selected
30 from the group consisting of isooctyl acrylate, 2-ethyl hexyl acrylate, butyl acrylate,

and combinations thereof. The amount of the acrylic or methacrylic acid ester preferably is less than 50 parts by weight.

The hydrophilic, ethylenically unsaturated monomer preferably is selected from the group consisting of acrylate-terminated poly(alkylene oxides) and methacrylate-terminated poly(alkylene oxides). A preferred monomer is an
5 acrylate-terminated poly(ethylene glycol) monomer. The amount of the hydrophilic, ethylenically unsaturated monomer preferably is between 30 and 60 parts by weight.

The polar, ethylenically unsaturated monomer preferably is selected from the group consisting of acrylic acid, methacrylic acid, itaconic acid, acrylamide, methacrylamide, lower alkyl-substituted acrylamides (e.g., methyl, ethyl and t-butyl-
10 substituted acrylamides), N-vinyl-pyrrolidone, and combinations thereof, with acrylic acid being preferred. The amount of the polar, ethylenically unsaturated monomer preferably is between 15 and 25 parts by weight.

An example of a preferred composition is one that includes the reaction
15 product of isooctyl acrylate, acrylate-terminated poly(ethylene glycol), and acrylic acid. The composition is preferably in the form of a pressure sensitive adhesive. The dressing preferably includes a backing on which the composition is provided.

The composition preferably is capable of absorbing at least about 100%, more preferably at least about 200%, and even more preferably at least about 300%
20 by weight phosphate buffered saline after 24 hours while substantially retaining its structural integrity and transparency.

In a second aspect, the invention features an absorbent dressing that includes a transparent, elastomeric, body fluid-absorbing composition in which the composition includes the reaction product of:

- 25 (a) an acrylic or methacrylic acid ester of a non-tertiary alcohol having between 4 and 14 carbon atoms, inclusive;
- (b) at least 30 parts by weight of a hydrophilic, ethylenically unsaturated monomer; and
- (c) a polar, ethylenically unsaturated monomer different from the
30 hydrophilic, ethylenically unsaturated monomer. The composition is capable of absorbing medium to heavy amounts of body fluids while retaining its structural

integrity and transparency. Moreover, the composition is essentially free of hydrocolloidal gel particles.

5 In preferred embodiments, the amount of the hydrophilic, ethylenically unsaturated monomer is between 30 and 60 parts by weight. The composition preferably includes the reaction product of less than 50 parts by weight of the acrylic acid or methacrylic acid ester, 30 to 60 parts by weight of the hydrophilic, ethylenically unsaturated monomer, and 15 to 25 parts by weight of the polar, ethylenically unsaturated monomer. A preferred composition is the reaction product of isooctyl acrylate, acrylate-terminated poly(ethylene glycol), and acrylic acid.

10 The invention also features a method of treating an exuding wound that includes applying one of the above-described dressing to the wound and allowing the dressing to absorb body fluids exuded from the wound. Furthermore, the invention features transparent, elastomeric, body fluid-absorbing compositions that include the above-described reaction products and have the above-described properties.

15 In a third aspect, the invention features a method for preparing a transparent, elastomeric, body fluid-absorbing composition that includes exposing an essentially solvent-free monomeric mixture or pre-polymeric syrup to actinic radiation to form the composition. The mixture or syrup includes: (a) an acrylic or methacrylic acid ester of a non-tertiary alcohol having between 4 and 14 carbon atoms, inclusive; (b) a hydrophilic, ethylenically unsaturated monomer; and (c) a polar, ethylenically unsaturated monomer different from the hydrophilic, ethylenically unsaturated monomer. The resulting composition is essentially free of hydrocolloidal gel particles and capable of absorbing moderate to heavy amounts of body fluids while retaining its structural integrity and transparency. In preferred

20 25 30 The invention provides improved dressings based upon transparent, elastomeric, body fluid-absorbing compositions that retain their transparency after absorbing body fluids. The dressings thus permit observation of a wound or ostomy

site without requiring removal of the dressing, thereby saving time and money, and avoiding disruption of the healing process. The compositions also display a good balance of absorptive and cohesive properties. Thus, they retain their integrity even after absorbing relatively large amounts of body fluids. Moreover, because the compositions are prepared using a solvent-free, bulk polymerization process, thick compositions can be readily prepared. Such compositions are desirable because fluid absorbency increases with increasing thickness.

Other features and advantages of the invention will be apparent from the following description of the preferred embodiments thereof, and from the claims.

Description of the Preferred Embodiments

Transparent, elastomeric, body fluid-absorbing compositions suitable for incorporation in absorbent dressings are prepared from the monomers described in the Summary of the Invention using a photoinitiated, solvent-free, bulk polymerization process. The compositions are preferably in the form of pressure sensitive adhesives to facilitate application to skin. Moreover, the compositions are essentially free of hydrocolloidal gel particles.

The relative amounts of the respective monomers are selected to maximize the fluid absorbency of the composition. At the same time, however, the resulting composition must have sufficient cohesive strength such that it resists disintegrating after absorbing body fluids. Phosphate buffered saline is used as a measure of the composition's performance in the presence of body fluids because it reasonably approximates the composition of body fluids found in wound exudate.

Another important feature of the compositions is the ability to maintain transparency upon absorbing body fluids to the extent that the wound underlying the dressing can be visualized through the dressing. This obviates the need to remove the dressing to observe the underlying wound.

Examples of suitable acrylic and methacrylic acid ester monomers include esters prepared by reaction with alcohols such as 1-butanol, 2-butanol, 1-pentanol, 2-pentanol, 3-pentanol, 2-methyl-1-butanol, 1-hexanol, 2-hexanol, 2-methyl-1-pentanol, 3-methyl-1-pentanol, 2-ethyl-1-butanol, 3,5,5-trimethyl-1-hexanol, 3-

heptanol, 1-octanol, 2-octanol, isooctyl alcohol, 2-ethyl-1-hexanol, 1-decanol, 1-dodecanol, 1-tridecanol, 1-tetradecanol, and the like, as well as combinations thereof. Particularly preferred ester monomers include isooctyl acrylate, 2-ethyl hexyl acrylate, and n-butyl acrylate. The amount of ester monomer preferably is less than 50 parts by weight (based upon 100 parts total monomer composition).

Examples of suitable ethylenically unsaturated hydrophilic monomers include free radically reactive hydrophilic oligomers (a polymer having a low number of repeating units, generally 2 to 20) and/or polymers including poly(alkylene oxides) (e.g., poly(ethylene oxide)), poly(vinyl methyl ether), poly(vinyl alcohol), cellulose derivatives, and mixtures thereof. Other suitable ethylenically unsaturated hydrophilic monomers include macromonomers, e.g., acrylate-terminated poly(ethylene oxide), methacrylate-terminated poly(ethylene oxide), methoxy poly(ethylene oxide) methacrylate, butoxy poly(ethylene oxide) methacrylate, p-vinyl benzyl-terminated poly(ethylene oxide), acrylate-terminated poly(ethylene glycol), methacrylate-terminated poly(ethylene glycol), methoxy poly(ethylene glycol) methacrylate, butoxy poly(ethylene glycol) methacrylate, p-vinyl benzyl-terminated poly(ethylene glycol), poly(ethylene oxide) diacrylate, poly(ethylene oxide) dimethacrylate, and combinations thereof. Particularly preferred ethylenically unsaturated hydrophilic monomers include acrylate and methacrylate esters prepared from mono-hydroxyl-terminated poly(lower alkylene oxides) such as polyethylene and polypropylene glycols commercially available under the trade designation Carbowax from Union Carbide Corp. in a variety of molecular weights (e.g., Carbowax 350, Carbowax 550, Carbowax 750, Carbowax 2000, and Carbowax 5000). An example of a preferred acrylate-terminated polyethylene glycol is commercially available from Shin-Nakamura Chemical Co., Ltd., Japan, under the designation "NK Ester AM-90G."

The amount of hydrophilic monomer preferably ranges from 30 to 60 parts by weight (based upon 100 parts total monomer composition).

Examples of suitable polar monomers include acrylic acid, methacrylic acid, itaconic acid, acrylamide, methacrylamide, lower alkyl-substituted acrylamides (e.g., methyl, ethyl and t-butyl-substituted acrylamides), N-vinyl-pyrrolidone, and

combinations thereof. The preferred polar monomer is acrylic acid. The amount of polar monomer preferably ranges from 15 to 25 parts by weight (based upon 100 parts total monomer composition).

One or more multifunctional crosslinking monomers may be included as well. The term "multifunctional" as used herein refers to crosslinking monomers which have two or more free radically polymerizable, ethylenically unsaturated groups. Useful multi-functional crosslinking monomers include acrylic or methacrylic esters of diols such as butanediol diacrylate, triols such as glycerol, and tetraols such as pentaerythritol. Other useful multifunctional crosslinking monomers include polymeric multifunctional (meth)acrylates, e.g., poly(ethylene oxide) diacrylate or poly(ethylene oxide) dimethacrylate; polyvinyl crosslinking agents such as substituted and unsubstituted divinylbenzene; and difunctional urethane acrylates such as "EBECRYL" 270 and "EBECRYL" 230 (1500 weight average molecular weight and 5000 weight average molecular weight acrylated urethanes, respectively--both available from Radcure Specialties), and combinations thereof.

When a crosslinking monomer is employed, the amount is selected such that the fluid absorbency of the composition is not substantially compromised. In general, the crosslinking monomer (when present) is employed at a level of up to about 10 equivalent weight percent. The "equivalent weight percent" of a given compound is defined as the number of equivalents of that compound divided by the total number of equivalents in the total monomer composition, where an equivalent is the number of grams divided by the equivalent weight. The equivalent weight is defined as the molecular weight divided by the number of polymerizable groups in the monomer (in the case of those monomers with only one polymerizable group, equivalent weight equals molecular weight).

A photoinitiator is included in the monomer mixture as well. Useful photoinitiators include substituted acetophenones such as benzyl dimethyl ketal and 1-hydroxycyclohexyl phenyl ketone, substituted alpha-ketols such as 2-methyl-2-hydroxypropiophenone, benzoin ethers such as benzoin methyl ether, benzoin isopropyl ether, substituted benzoin ethers such as anisoin methyl ether, aromatic

sulfonyl chlorides, and photoactive oximes. The amount of photoinitiator typically ranges from about 0.001 to about 5.0 parts by weight per 100 parts of total monomer, preferably from about 0.01 to about 5.0 parts by weight, and more preferably from about 0.1 to about 0.5 parts by weight.

5 Other materials which may be added to the monomer mixture include chain transfer agents for controlling molecular weight (e.g., carbon tetrabromide, mercaptans, or alcohols), tackifiers, plasticizers (e.g., polyethylene glycol, polypropylene glycol, or glycerin), perfumes, deodorants, antioxidants, and pharmacologically active ingredients such as drugs, antibiotics, and anti-microbial agents.

10 The compositions are prepared by photoinitiated bulk polymerization according to the technique described in Martens et al., U.S. Patent No. 4,181,752. The polymerizable monomers and photoinitiator are mixed together in the absence of solvent and partially polymerized to a viscosity in the range of from about 500 cps to about 50,000 cps to achieve a coatable syrup. The crosslinking agent (if present) and any other ingredients are then added to the prepolymerized syrup. Alternatively, these ingredients (with the exception of the crosslinking agent) can be added directly to the monomer mixture prior to pre-polymerization.

20 The resulting composition is coated onto a substrate (which may be transparent to ultraviolet radiation) and polymerized in an inert (i.e., oxygen-free) atmosphere, e.g., a nitrogen atmosphere by exposure to ultraviolet radiation. Examples of suitable substrates include release liners (e.g., silicone release liners) and tape backings (which may be primed or unprimed paper or plastic). A sufficiently inert atmosphere can also be achieved by covering a layer of the polymerizable coating with a plastic film which is substantially transparent to ultraviolet radiation, and irradiating through that film in air, as described in the

25 aforementioned Martens et al. patent using ultraviolet lamps. The ultraviolet light source preferably has 60% of its emissions, and more preferably at least 75% of its emissions, between 280 and 400 nm, with an intensity ranging from about 0.1 to

30 about 25 mW/cm².

Where multi-layer constructions are desirable, one method of construction is multi-layer coating using conventional techniques. For example, the coatings may be applied concurrently (e.g., through a die coater), after which the entire multi-layer structure is cured all at once. The coatings may also be applied sequentially
5 whereby each individual layer is partially or completely cured prior to application of the next layer.

The compositions can be included in a variety of dressing constructions known in the art. Typically, the composition is in the form of a continuous or discontinuous coating on at least one major surface of a backing. The backing may
10 include one or more layers. Examples of suitable backings include materials with a relatively low content of hydrophilic components such as polyester (e.g., commercially available under the designation "Hytrel™," such as Hytrel™ 4056, from DuPont Co.), polyurethane (e.g., commercially available under the designation "Estane™," such as Estane™ 58309, from B.F. Goodrich Co.), polyester block
15 amide (e.g., commercially available under the designation "Pebax™," such as Pebax™ 2533 and 3533, from Atochem Co.), and porous polyethylene resins. Also suitable are materials having a relatively high content of hydrophilic components (and thus high moisture vapor transmission properties). Examples include certain polyester amides such as Pebax™ 4011RN00 (Atochem Co.), porous polyethylenes
20 as described in U.S. Patent No. 4,539,256, and polyurethanes described in U.S. Patent Nos. 3,645,535 and 4,598,004. Both classes of materials may also be used in combination with each other (e.g., in sandwich-type arrangements) to tailor the moisture vapor transmission properties of the dressing.

Examples of specific dressing configurations for which the compositions are
25 suitable are described in Olson, U.S. Patent No. 4,952,618.

The invention will now be further described by way of the following examples.

EXAMPLES

General Polymerization Process

A vial was charged with isooctylacrylate, after which 0.04% by weight photoinitiator (benzyl dimethyl ketal) was added and stirred until dissolution.

5 Acrylic acid and polyethylene glycol acrylate ("NK Ester--AM-90G" from Shin-Nakamura Chemical Co., Ltd., Japan) were then added to the solution and the resulting solution reacted to form a pre-polymerized syrup. A second portion of photoinitiator was added to the syrup, after which the syrup was coated between two release liners; the total amount of photoinitiator used was 0.4% by weight of

10 the total monomer weight. One of the release liners was typically a clear polyethylene terephthalate film and the other liner was either paper or a second polyethylene terephthalate film. The caliper was set at 40-45 mils for each sample during the coating process.

Following coating, the sample was cured by exposure to a series of

15 ultraviolet black lights (Sylvania Corp.) at a peak wavelength of 350 nm and an intensity of 40W.

Test Methods

Absorbency

20 A preweighed sample of the composition (W_i) was placed in a 6 oz. (180 mL) bottle containing 30 mL of phosphate buffered saline (PBS, pH = 7.2) (Sigma Chemical Co.). The bottle was capped and allowed to stand without agitation. Samples were removed intermittently at fixed intervals, blotted dry, and weighed. A final weight (W_f) was obtained after 24 hours of exposure. The absorbency was

25 calculated using the following formula:

$$\text{Absorbency} = (W_f - W_i)/W_i$$

Absorbency data is reported in Table 1.

Moisture Vapor Transmission Rate

The moisture vapor transmission rate was measured according to ASTM E-

30 96-80 using a modified Payne cup method. Specifically, a 35 mm diameter sample of 1 mil (0.025 mm) thick material to be tested containing no perforations was cut.

The sample was placed between adhesive-containing surfaces of two foil adhesive rings, each having a one inch (2.54 cm) diameter hole. The holes of each ring were carefully aligned. Finger pressure was used to form a foil/sample/foil assembly that was flat, wrinkle-free, and had no void areas in the exposed sample.

5 A 4 oz. (0.14 kg) glass jar was filled half-way with distilled water. The jar was fitted with a screw-on cap having a 1.50 inch (3.8 cm) diameter hole in the center thereof and with a 1.75 inch (4.45 cm) diameter rubber washer having a 1.12 inch (2.84 cm) diameter hole in its center. The rubber washer was placed on the lip of the jar and the foil/sample assembly was placed on the rubber washer. The lid
10 was then screwed loosely on the jar.

The assembly was placed in a chamber at 100EF (38EC) and 20% relative humidity for four hours. The cap was tightened inside the chamber so that the sample was level with the cap (no bulging) and the rubber washer was in proper seating position.

15 At the end of four hours, the foil/sample assembly was removed from the chamber and weighed immediately to the nearest 0.01 gram (initial weight W_1). The assembly was then returned to the chamber for at least 18 hours, after which it was removed and weighed immediately to the nearest 0.01 gram (final weight W_2). The moisture vapor transmission rate (MVTR) in grams of water vapor transmitted
20 per square meter of sample area in 24 hours was calculated according to the following formula (where "T" refers to exposure time in hours):

$$MVTR = (W_1 - W_2) (4.74 \times 10^4) / T$$

Three measurements of each sample were made, and the average value taken. The MVTR values are reported in Table 2 in $\text{g/m}^2/24 \text{ hrs}$.

25

Skin Adhesion

Adhesion to skin was determined utilizing dressings prepared using the compositions prepared in Examples 1-7. The laminate dressings were cut into 2.5 cm x 7.5 cm strips which were then applied to the backs (left side = dry; right side =
30 wet) of a selected number of individuals. During application and removal of the test strips, the individuals were lying on procedure tables in prone positions with arms at

their sides and heads turned to one side. For each individual, two or three strips of the test material were applied on each of the sides of the spinal column and positioned such that the length of each strip was at a right angle to the spinal column. The strips were applied without tension or pulling of the skin, and there was at least 0.3 cm to 1 cm space between each strip. After all strips were in place, a 2 kg rubber roller according to the specifications found in the 7th Edition of the Pressure-Sensitive Tape Council Brochure (1976) was rolled along the length of each strip, once in each direction, at a travel speed of about 7.6 cm per second, to assure even pressure application of each strip. When rolling the strip, no manual pressure was applied to the roller.

To determine the adhesive value, each strip was removed using a conventional adhesion tester having a 11.4 kg test line and a 2.5 cm clip attached to the test line. The clip was attached to the edge of the strip which is farthest from the spinal cord, the clip being attached by manually lifting about 1 cm of that edge of the strip and attaching the clip thereto. This orientation permitted the strip to be removed towards the spine so that pull was with the direction of the hair growth on the back. This was facilitated by positioning the adhesion tester opposite the side of the individual's back from which the strip was to be removed. The adhesion tester was aligned with, and was at the same height as, the strip to be removed. An example of a suitable adhesion tester for use in this test comprises a conventional motor driven screw with moving carriage and a transducer. Connection to the transducer was a load cell accessory. Removal force placed on the transducer resulted in a signal change which was passed through a readout meter to a strip chart recorder.

Wet and dry skin adhesion data is reported in Table 3 in gm/2.54 cm. Dry adhesion values were determined initially (T_0) and after 24 hours (T_{24}). Wet adhesion values were determined initially (T_0).

Integrity

A preweighed sample of the composition (W_i) in the form of a 5 cm disc was placed in a 6 oz. (180 mL) bottle containing 30 mL of phosphate buffered saline (PBS, pH = 7.2) (Sigma Chemical Co.). The bottle was capped and agitated

on a shaker (Eberbach Co., Ann Arbor, MI) at low speed for a period of 24 hours. The sample was then removed from the bottle, transferred to a metal pan, and dried in a forced-air oven maintained at 65°C until dry (typically about 12-16 hours). Following drying, the sample was weighed (W_f). The Integrity Value was
5 calculated according to the following formula:

$$\text{Integrity Value} = W_f/W_i \times 100$$

Integrity data is reported in Table 4.

Example 1

10 A composition was prepared using 80 parts isooctyl acrylate, 6.0 parts acrylic acid, and 14.0 parts polyethylene glycol acrylate, and tested according to the above-described test methods. Test results are shown in Tables 1-4.

Example 2

15 A composition was prepared using 70 parts isooctyl acrylate, 9.0 parts acrylic acid, and 21.0 parts polyethylene glycol acrylate, and tested according to the above-described test methods. Test results are shown in Tables 1-4.

Example 3

20 A composition was prepared using 60 parts isooctyl acrylate, 12.0 parts acrylic acid, and 28.0 parts polyethylene glycol acrylate, and tested according to the above-described test methods. Test results are shown in Tables 1-4.

Example 4

A composition was prepared using 50 parts isooctyl acrylate, 15.0 parts acrylic acid, and 35.0 parts polyethylene glycol acrylate, and tested according to the above-described test methods. Test results are shown in Tables 1-4.

25 Example 5

A composition was prepared using 40 parts isooctyl acrylate, 18.0 parts acrylic acid, and 42.0 parts polyethylene glycol acrylate, and tested according to the above-described test methods. Test results are shown in Tables 1-4.

Example 6

A composition was prepared using 30 parts isooctyl acrylate, 21.0 parts acrylic acid, and 49.0 parts polyethylene glycol acrylate, and tested according to the above-described test methods. Test results are shown in Tables 1-4.

Example 7

- 5 A composition was prepared using 20 parts isooctyl acrylate, 24.0 parts acrylic acid, and 56.0 parts polyethylene glycol acrylate, and tested according to the above-described test methods. Test results are shown in Tables 1-4.

10

TABLE 1
ABSORBENCY

EXAMPLE	Amount of PBS Absorbed (@ 24 hrs)
1	0.231
2	1.662
3	2.308
4	5.316
5	8.060
6	8.587
7	12.132

TABLE 2
MOISTURE VAPOR TRANSMISSION RATE (G/M²/DAY)

EXAMPLE	MVTR (G/M ² /DAY)
1	1432
2	1855
3	4668
4	6754
5	6685
6	6035
7	6395

TABLE 3
SKIN ADHESION (GM/2.54 CM)

EXAMPLE	Adhesion (gm/2.54 cm)		
	Dry	Wet	
	T ₀	T ₂₄	T ₀
1	379	667	224
2	183	433	116
3	112	254	55
4	101	262	43
5	55	104	61
6	25	46	27
7	30	211	43

TABLE 4
INTEGRITY

EXAMPLE	INTEGRITY
3	99.3%
4	98.6%
5	97.4%

Other embodiments are within the following claims.

What is claimed is:

1. An absorbent dressing comprising a transparent, elastomeric, body fluid-absorbing composition,
5 said composition comprising the reaction product of:
 - (a) 20 to 80 parts by weight of an acrylic or methacrylic acid ester of a non-tertiary alcohol having between 4 and 14 carbon atoms, inclusive;
 - (b) 10 to 60 parts by weight of a hydrophilic, ethylenically unsaturated monomer; and
 - 10 (c) 5 to 25 parts by weight of a polar, ethylenically unsaturated monomer different from said hydrophilic, ethylenically unsaturated monomer, said composition being capable of absorbing moderate to heavy amounts of body fluids while retaining its structural integrity and transparency, said composition being essentially free of hydrocolloidal gel particles.
- 15 2. An absorbent dressing according to claim 1 wherein said acrylic or methacrylic acid ester is selected from the group consisting of isooctyl acrylate, 2-ethyl hexyl acrylate, butyl acrylate, and combinations thereof.
- 20 3. An absorbent dressing according to claim 1 wherein said hydrophilic, ethylenically unsaturated monomer is selected from the group consisting of acrylate-terminated poly(alkylene oxides) and methacrylate-terminated poly(alkylene oxides).
- 25 4. An absorbent dressing according to claim 1 wherein said polar, ethylenically unsaturated monomer is selected from the group consisting of acrylic acid, methacrylic acid, itaconic acid, acrylamide, methacrylamide, lower alkyl-substituted acrylamides, N-vinyl-pyrrolidone, and combinations thereof.

5. An absorbent dressing according to claim 1 wherein said composition comprises the reaction product of isooctyl acrylate, acrylate-terminated poly(ethylene glycol), and acrylic acid.

5 6. An absorbent dressing according to claim 1 wherein said composition is capable of absorbing at least about 100% by weight phosphate buffered saline after 24 hours while substantially retaining its structural integrity and transparency.

10 7. An absorbent dressing according to claim 1 wherein said composition is in the form of a pressure sensitive adhesive.

8. An absorbent dressing according to claim 1 further comprising a backing on which said composition is provided.

15 9. An absorbent dressing comprising a transparent, elastomeric, body fluid-absorbing composition,

said composition comprising the reaction product of:

- (a) an acrylic or methacrylic acid ester of a non-tertiary alcohol having between 4 and 14 carbon atoms, inclusive;
- 20 (b) at least 30 parts by weight of a hydrophilic, ethylenically unsaturated monomer; and
- (c) a polar, ethylenically unsaturated monomer different from said hydrophilic, ethylenically unsaturated monomer,
- 25 said composition being capable of absorbing moderate to heavy amounts of body fluids while retaining its structural integrity and transparency,
- said composition being essentially free of hydrocolloidal gel particles.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 97/13296

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61L15/58 A61L25/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A61L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 84 03837 A (MINNESOTA MINING & MFG) 11 October 1984 see page 7, line 14 - page 11, line 23 see page 13, line 10 - line 34 see claims; examples ---	1-5, 7-9
X	EP 0 387 751 A (NITTO DENKO CORP) 19 September 1990 see page 3, line 7 - page 4, line 13 see page 4, line 29 - line 31 see claims 7-9 ---	1-4, 7-9
X	EP 0 369 092 A (NITTO DENKO CORP) 23 May 1990 see page 2, line 10 - line 34 see page 3, line 16 see page 3, line 18 - line 48 ---	1, 2, 4, 7-9
	--- -/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"A" document member of the same patent family

Date of the actual completion of the international search

9 December 1997

Date of mailing of the international search report

18/12/1997

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3018

Authorized officer

Cousins-Van Steen, G

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 97/13296

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>EP 0 601 463 A (NITTO DENKO CORP) 15 June 1994 see page 2, line 42 - line 48 see page 7, line 7 - line 27 -----</p>	1,6
A	<p>US 4 181 752 A (CLEMENS LAWRENCE M ET AL) 1 January 1980 cited in the application -----</p>	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 97/13296

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 8403837 A	11-10-84	AU 2860984 A BR 8406510 A EP 0140941 A JP 60500992 T	25-10-84 12-03-85 15-05-85 04-07-85
EP 0387751 A	19-09-90	JP 2243626 A JP 2255612 A JP 3005422 A DE 69009540 D DE 69009540 T	27-09-90 16-10-90 11-01-91 14-07-94 29-09-94
EP 0369092 A	23-05-90	DE 68911654 D DE 68911654 T JP 2232048 A JP 2584866 B KR 9701499 B	03-02-94 07-04-94 14-09-90 26-02-97 11-02-97
EP 0601463 A	15-06-94	JP 8103490 A US 5429590 A	23-04-96 04-07-95
US 4181752 A	01-01-80	NONE	